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# RESEARCH STANCHION AND TRANSPORTER FOR SMALL RUMINANTS

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U S ARMY RESEARCH INSTITUTE  
OF  
ENVIRONMENTAL MEDICINE  
Natick, Massachusetts

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## ABSTRACT

A stanchion has been developed to restrain, confine, support, and transport a goat for the purpose of medical examination, surgical procedures, and data collection. The basic design criteria was to provide an instrument that will fill a void in restraining devices for the goat, in order to facilitate medical research and veterinary medicine.



## INTRODUCTION

→ One crucial element of any research study involving large animals is the ability to restrain the animal while data are collected. In small animals, the weight and size of the animal are relatively unimportant factors, but in larger animals they can make restraint difficult to achieve safely. The use of a restraining device in a research setting is dependent on its versatility, mobility, and effectiveness under a variety of laboratory conditions. Some commercially produced stanchions (Shoreline Mfg. Company, Kansas City, Missouri and Research Equipment Company, Bryan, Texas) for large farm animals are not suitable for restraining mid-size animals under a variety of laboratory conditions because of their design. Furthermore, there have been no reports in the literature describing stanchions, except those used in other studies (9,11,13,15,17), which are not suitable in design to restrain mid-size animals for experiments involving control of ventilation. → Page 2

Large-animal restraining devices became a reality in the early 1880's to restrain cattle and horses for the purposes of shoeing, tattooing and performing various veterinary procedures (1,2,3,4). These devices were useful for those purposes, but have limitations when applied to mid-sized animals in a research setting. Many of these stanchions are not free-standing (that is they require a stall to be functional), are not portable, can not be used to transport animals, have non-adjustable stanchion bars and lack a means to support an anaesthetised animal. Several newer designs for larger animals eliminate some of these problems (6,8,12,13,14,15,16) but are not suitable for mid-size animals such as Capra lircus (goats) which are widely used in research. Other designs reported in the literature are not easily adaptable to other animal species and some are very restrictive.

The research animal stanchion reported here was designed for goats (Capra) to control movements without shackling the animal.

#### SYSTEM DESCRIPTION

→ The stanchion is constructed entirely of stainless steel to prevent chemical decomposition and eliminate hazards inherent with other materials. Stainless steel also allows the device to be easily dis-infected prior to surgical procedures. ←

The main frame of this stanchion (Fig.1) is constructed with welded 3.81 cm (1.5 in) stainless steel tubing and angle stock. The front section consists of moveable vertical poles which clamp around the neck of the animal to restrict its movement. The top of each pole has a interlocking spring-loaded adjustable mechanism. The pole mechanism (Fig.2) can be adjusted on the top and bottom of the frame in evenly spaced increments of 1.91 cm (3/4 in). Adjustment of the head opening requires manual compression of the top end of the pole and placement of the bottom end into a different slot. The top adjustment does not close completely. A space 12.7 cm (5in) is present to accommodate the circumference of the neck of adult goats (Capra).

At the rear of the stanchion is a rectangular door (55.88 cm x 106.68 cm), which has pin-type hinges for easy opening and removal. It also has a quick-release pin mechanism which secures this door to the frame while the animal is in the stanchion. On each side of the stanchion are removeable stainless steel kick shields (Fig.3, 45.72 cm x 60.96 cm), which have clip-on brackets.

Waste products excreted are collected in a large, removeable 20-gauge (104.14 cm x 50.8 cm x 10.16 cm) stainless steel tray at the base of the

stanchion (Fig.3). The animal stands in the tray during data collection. The tray rests on a perforated floor (Fig.4) which consists of a metal plate (106.68 cm x 52.07 cm x 0.318 cm) and is welded to the basic framework. A durable, reinforced vinyl sling (Fig.5, 86.36 cm x 48.26 cm) provides support for animals during long experiments, during surgical procedures and while the animal is recovering from anaesthesia. Our animals have been restrained for up to ten hours without any changes in resting ventilation. The sling is suspended from the horizontal framework by two 3.81 cm stainless steel tubes with permanently fastened "S" hooks which are spaced 11.11 cm (4.375 in) apart along the length of the bar. In later stanchion models, quick-release pins allowed rapid changes in the height of the sling without the aid of additional tools. This feature permits surgical teams to alter the position of the animal without delay or additional personnel. The sling has eyelets spaced 11.11 cm apart to accept hooks and position the sling at the selected level.

The front leg openings measure 7.82 cm x 17.78 cm, while the rear leg openings measure 7.62 cm x 10.16 cm. Openings are spaced to accommodate goat's leg in a weight range of 25 to 65 kilograms. Measurements for leg openings were made half-way on the femurs and humors on several animal's legs.

For easy portability, the stanchion has four corrosion-resistant wheels, which allows transportation of anaesthetized animals between rooms if necessary. The wheels have locks to prevent movement.

Other equipment such as transducers, infusion pumps and bottles of infusion fluids are attached to the frame with clamps. This eliminates the need for additional racks and tables to mount supplemental equipment.

## DISCUSSION

We have used stanchions of this type for six years for ventilatory studies with awake animals and for surgical preparation of anaesthetized goats (Capra). These animals sometimes require restraint to prevent injury to laboratory personnel and to collect more valid data. No excessive force is required to manipulate mid-sized, horned animals. The stanchion is portable, durable, chemical resistant and adequate to contain 25 to 65 kilogram animals. The stanchion has been used for the induction of anaesthesia, as well as the transportation of goats from recovery.

The stanchion also minimises injury to the animal. The closable metal door and side shields also prevent any unexpected movement of the animal from resulting in injury to the researcher. The side shields also deflect body wastes which are excreted during long experiments. Waste products are collected in a metal tray at the base of the stanchion and do not contaminate the working environment.

The animals, goats (Capra), require no training and quickly adjust to restraint in this stanchion. This is due to the type of restraint and the nature of goats (Capra) in general. Animals are led through the back of the stanchion via a metal door. The animal's head is then placed through the open stanchion poles which are closed to within two centimeters of the neck to prevent excessive movement. The door is then closed at the rear of this device. The sling was placed at the animal's feet prior to placement. Each leg is grasped one at a time and placed into the holes in the sling. The fixed S-hooks are used to anchor the sling to the side bars of the stanchion. This procedure is used prior to any induction of anaesthesia. In horned animals, such as goats (Capra),

we have found that the pole mechanism (Fig. 2) and sling are equally important in providing restraint. Stress problems associated with restraint were not detectable during physiological measurements. Restraint related stress has been observed in some animals and behavioral changes are commonly noticed as increased anxiety or hyperactivity (7) in those animals. We have successfully restrained goats in these stanchions for up to 8 hours without any elevation of resting ventilation or other parameters. No adverse behavioral changes have been observed in our animals. Many restraining devices in the literature contain slings to support the animal's body weight (5,6,8,10,15,16,18). However, these designs are very restrictive and should not be used for the assessment of resting ventilation. These sling-like devices are also used to suspend the animal, whereas in this stanchion the sling uses mild restraint to limit forward movement. The sling does not support the animal's weight unless the animal is anaesthetized or is tired of standing.

The stanchion poles are spring-loaded and adjustable to allow rapid release of the animal. This is extremely important during recovery from anaesthesia because some animals have been known to thrash during recovery. This design is also important to the researcher who requires control without shackling for respiratory measurements. In our experience, goats, (Capra) unlike other animals, are docile and easily adaptable to this type of restraint without training.

The stanchion is made of stainless steel which is corrosion resistant and is easily sanitized in large cage washers.

## SUMMARY

Stanchions are very important devices in animal research and surgery. The stanchion described has proven to be a useful tool for induction and recovery from general anaesthesia in addition to its use for animal experimentation. It has been used with goats (Capra) of various sizes and weights for a variety of procedures. We encourage modifications to this device to allow greater use of this tool in the area of animal science.

## ACKNOWLEDGEMENTS

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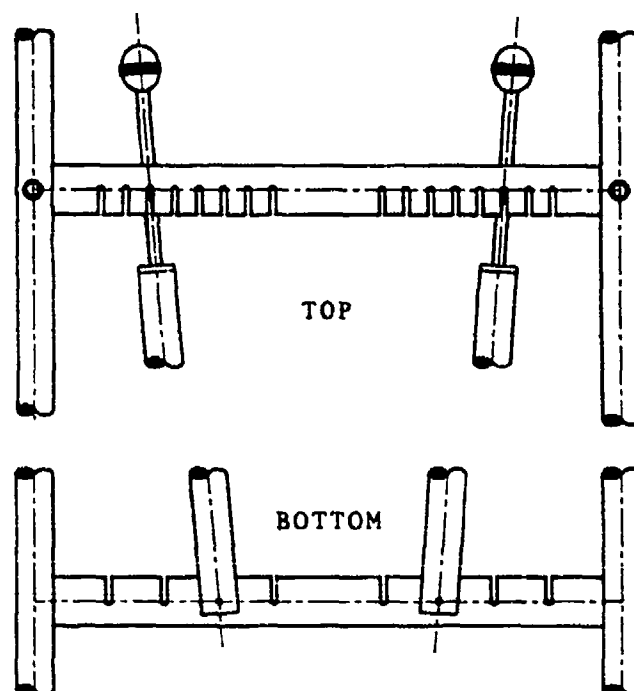


FIGURE 2



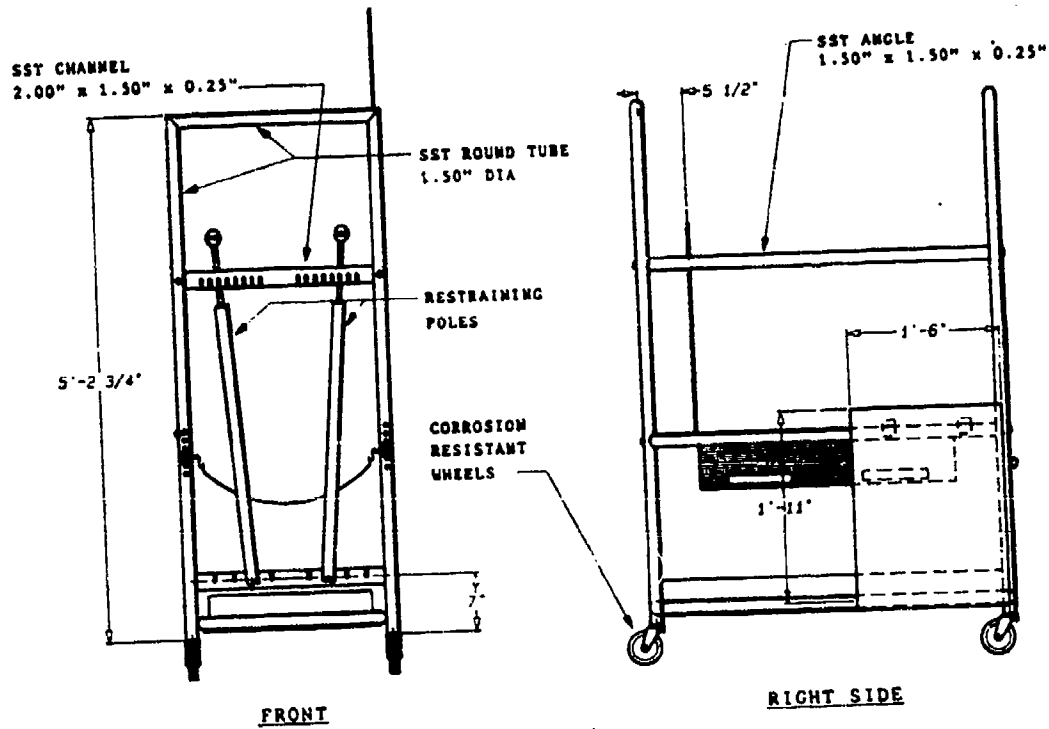


FIGURE 1

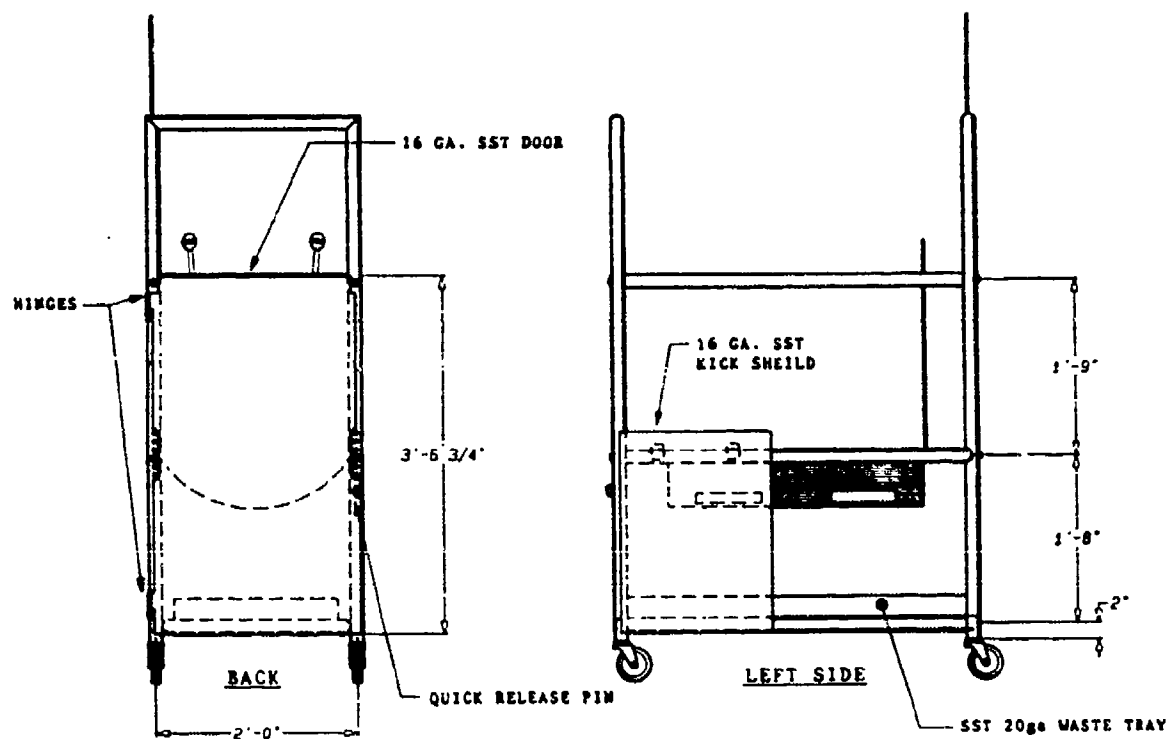
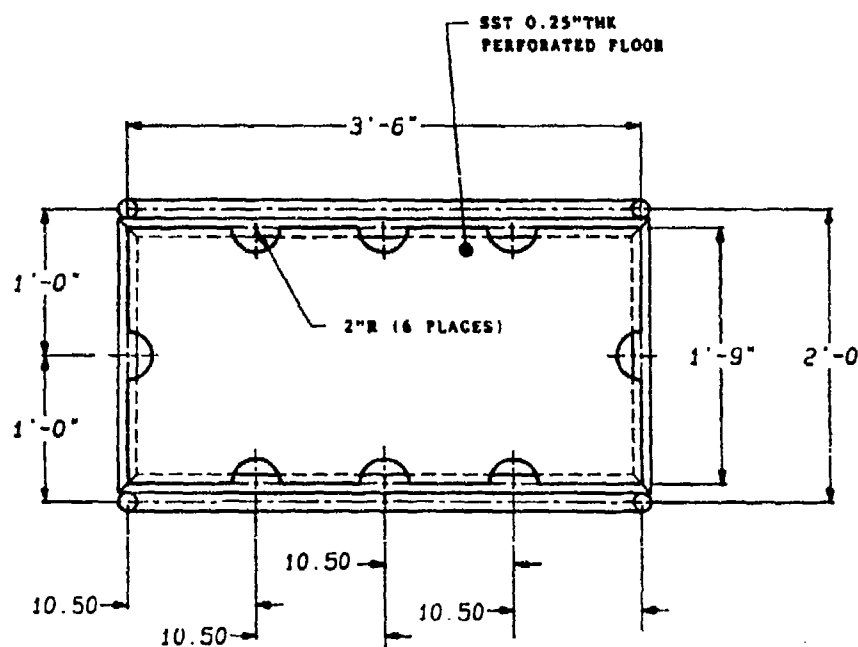
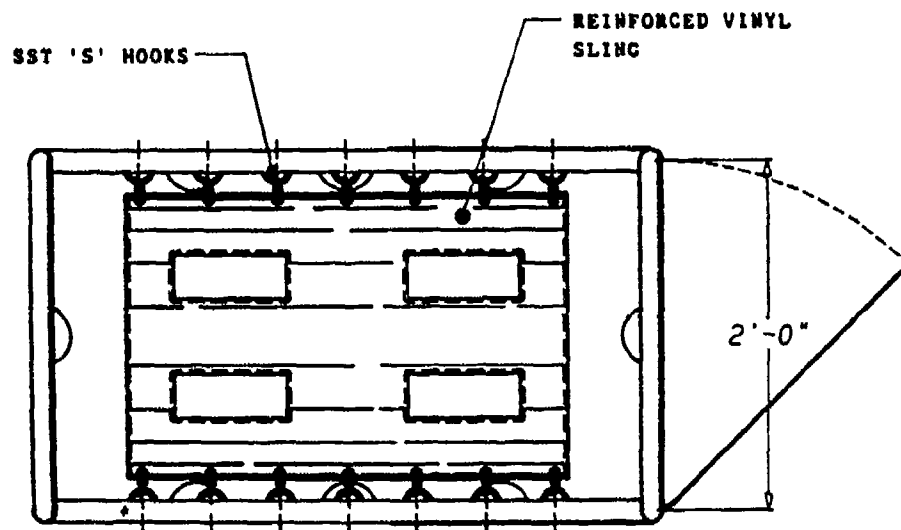


FIGURE 3



**BOTTOM**  
(Shown without wheels)

**FIGURE 4**



TOP

FIGURE 5

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## APPENDIX I

### MATERIALS LIST

#### 1. Stainless Steel Tubing:

a. Stainless steel tube 1-1/2" with at least 1/8" wall thickness. Total feet required is 43. The exact dimensions are: 4-pieces 62" long; 4-pieces 41" long; and 4-pieces 24" long.

b. 3/4" stainless steel tube, 2-pieces 3' long.

#### 2. Flatstock stainless steel:

1" width, 6 to 12"

#### 3. Sheetmetal stainless steel:

a. 16 gauge stainless steel plate, 12 square feet.

b. 18 gauge stainless steel plate, 10 square feet (tray stock).

#### 4. Stainless steel angle stock:

a. 1-1/2" x 1/4" angle, 7 feet.

b. 1-3/4" x 1/4" angle, 6 feet.

#### 5. Stainless steel round stock:

a. 1/4" diameter, S-hook stock, 6 feet.

b. 1/2" diameter, 10 feet.

#### 6. Miscellaneous materials:

a. Two 1/2" stainless steel springs.

b. Two stainless steel hinges or equivalent stock to fabricate.

c. Vinyl fabric (reinforced type) or canvass which has been water-proofed, 9 square feet.

d. Brass eyelets or stainless type, 16 pieces.

e. Four 3 1/2" polyethylene wheels with chemical resistant Delirin bearings; two rigid-type with locking mechanism, Mdl # 2-3008-91 and two Swivel-type, Mdl # 2-3056091 (Mfg. Colson Caster Corp, Jonesboro, Arkansas).

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